AD NUMBER

ADB201786

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

Distribution authorized to U.S. Gov't. agencies and their contractors; Foreign Government Information; NOV 1943. Other requests shall be referred to Air Service Command, Patterson Field, OH.

AUTHORITY

88 CG/SCCMF ltr dtd 25 Jun 2008

TRANSLATIONS
AIR SERVICE COMMAND

No. 10

STABILIZATION OF FALL IN DELAYED OPENING PARACHUTE JUMPS

G. Kotel'nikov

PATTERSON FIELD, FAIRFIELD, OHIO
NOVEMBER, 1943

AIR SERVICE COMMAND

TRANSLATION NO. 10

STABILIZATION OF FALL IN DELAYED OPENING PARACHUTE JUMPS*

G. Kotel'nikov

In landing paratroops accuracy is paramount. The solution to the problem of achieving accuracy in landing has been sought variously in development of a controllable parachute capable of maneuvering in drift, in development of a parachute equipped with wings to permit gliding flight, and in revival of the method of delayed inflation first introduced in the 1880's by Charles Leroux. According to this method, the parachute, which has a large apical vent or several smaller vents, is released from the pack with the skirt gathered, inflation being delayed to a low altitude. A fourth method of achieving accuracy in landing consists in delaying opening of the parachute pack to a minimum altitude (150-100 meters). Let us examine these methods.

1. Development Of A Controllable Parachute

The idea of developing a controllable parachute has long occupied the human mind. It is, however, doubtful whether a parachute can be given any independent motion to withstand drift without equipping it with a propeller power plant. Even if it should be possible to execute such a design,[1] the resistance offered by the canopy would be tremendous. Mass descents on parachutes equipped with propellers would hardly be feasible. Attempts to achieve controllability by modifying the form of the canopy, even to the extent of designing a triangular canopy, have not given any positive results thus far.

2. Equipment Of Parachute With Wings

Equipment of the parachute with wings for gliding descent with the parachute closed would make it possible to delay opening the parachute to a low altitude where drift is negligible. This method, however, would again be impractical for combat conditions. Being complex and unwieldy, this structure would deprive the jumper of much of his freedom of action and render it impossible to carry arms, skis, and other equipment. Wings would be an impediment in bailing out paratroopers, especially at night. Clearly, this method, like the propeller power plant method of controlling the landing should be left for peace times, and then only for individual sports jumps.

3. Delayed Inflation

Considerable effort has been directed toward improvement of the method of delayed inflation demonstrated by Charles Leroux. Development of Leroux's method has for the most part taken the form of construction of devices for regulating the rate of descent with the parachute released

*Samolet, 1936, No. 8, pp. 31-32.

[1] Reports indicate that a powered parachute has been developed in France.

from its pack but not inflated. As indicated above, the skirt of Leroux's canopy was gathered by means of a ring at the beginning of the jump. This ring was later pulled down by means of a cord. Thus the delay in inflation was accomplished with the parachute elongated without access of air to the canopy. In this position the canopy performed the function of stabilizer only, preventing the jumper from somersaulting at a high rate of fall. An analogous method for regulating the descent, namely by means of rings sewed inside the hem, was once proposed by the author of this article.

Other designs for descent to a certain altitude with a partially inflated canopy employ devices of an opposite character, that is, installation of one or several adjustable vents in the canopy. In the beginning of the fall these vents are open and the air is allowed to pass through the canopy almost freely, the canopy assuming the form of a tube or a sausage. Subsequently the central suspension line or "halyard" (usually colored) is used to close the vents and the jumper descends slowly with the canopy fully inflated.

One of the first patents issued for the vent adjustment was the German patent No. 344591 of August Roedinger in 1918. All other significant models with the vent adjustment, both Soviet and foreign, are essentially variants of Roedinger's design. None has been successful.

The author was present at two tests of parachutes with the vent adjustment, designated as "accurate landing models." These tests took place at the Tushin Airdrome in Moscow during the First All-Union Congress of Parachute Jumpers in 1935. The first test was held on August 14. Three jumpers were to bail out at an altitude of 1500 meters, fall to 500 meters with the canopy elongated sausagewise, close the vent, and land on a 100-meter target. The test was unsuccessful. All three jumpers landed somewhere beyond the airdrome. The second test was held several days later, on August 18, during the air show. According to the program there was to be a "delayed opening jump of 5 parachute jumpers from an ANT-9 airplane on PTP accurate landing parachutes." This test was likewise unsuccessful. All five jumpers landed not only outside the 100-meter target, but far beyond the airdrome.

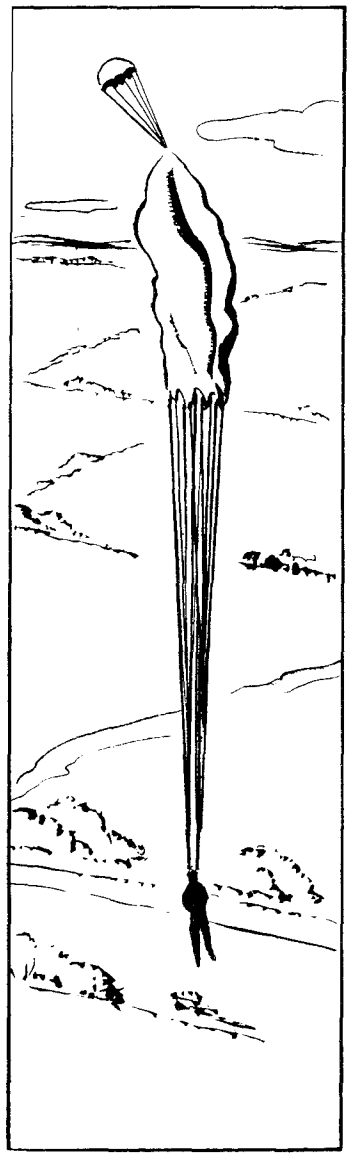

Figure 1

4. Delayed Opening

A fourth method remains for combating drift caused by air currents. This is the delayed opening jump, that is, the fall with the parachute pack closed, the pack being opened subsequently at the minimum safe distance from the ground. This method is considered to be the only feasible method for achieving accuracy in landing, by all our leading parachute jumpers, some of whom have set world records for delayed opening jumps from high altitudes.

Stabilization of Fall in Jumps With Delayed Opening

At this point we wish to discuss a circumstance in delayed opening jumps which has not been accorded sufficient attention to date. As known, the human body, with the parachute assembly, falls at a high rate during the delay and is subject to certain somersaulting which often develops into a dangerous spin. The authors of parachute manuals attempt to teach methods of emerging from a spin, apparently under the impression that the condition of somersault is perfectly normal.

Actually, however, the condition of somersaulting is not inherent but rather, is accidental. It can and should be eliminated. It has already been indicated, in connection with our discussion of descent on parachutes released from the pack but not inflated, that stabilization will prevent somersault. Here the fabric of the canopy acts as the stabilizer. Tests with parachutes with delayed inflation are however almost always subject to failure due to the complexity of the structure, fouling of the superfluous suspension lines, fouling of the central suspension line or "halyard", breaking of the vents, etc. The argument seems to be against such an enormous stabilizer as is represented by the parachute proper, when actually a small surface will suffice to hold a man in a vertical position.

These considerations led the author to seek a stabilizer of smaller dimensions. For this purpose he selected a pilot parachute, cut it down to 400 millimeters diameter, increased the size of the vent to 130 millimeters, and removed the spring-type stays. These stays, used in the conventional Soviet pilot parachute, have been known to cause wounds and even catastrophes. The modified pilot parachute is fastened to the main canopy at the loop around the suspension lines by means of a strong two-ply cord. The main canopy is packed normally and the pack is worn in the conventional manner. The pilot parachute however, is not packed. Instead, the parachute jumper places the folded chute into the breast pocket of his flying suit or underneath the belt of his harness. The chute, when folded, is no larger than a pocket handkerchief.

When the jumper bails out, he takes out the pilot parachute stabilizer and releases it in the air, where it immediately unfolds. The pilot parachute stabilizes the body firmly in a vertical position with the legs down. In this normal position the jumper can easily orient himself with respect to the moment of opening the pack. The stabilizer, being always under tension, will draw out the canopy much more energetically than otherwise. This fact in turn will make it possible to inflate the canopy at a lower altitude.

Tests conducted with the pilot parachute stabilizer gave excellent results. This method can be tried quite safely.

Automatic Opening Devices

In conclusion, a few words may be added on automatic opening devices. These devices, designed for the purpose of insuring opening of the parachute pack, consist of a remote control mechanism, which permits setting for a given delay. The delay is usually set for 1 to 25 seconds. For longer delays, a larger and heavier mechanism is required.

The utility of automatic opening devices for parachute training is unquestioned. The devices are not practical, however, for high altitude jumps. For such jumps a special relay is required to act on the automatic lock when the jumper comes within 150 to 100 meters of the ground. We have conducted a certain amount of research in this direction and have obtained some results.

The necessity for continued research to develop stabilization of fall in delayed opening parachute jumps, in combination with an efficient device for insuring parachute inflation at a minimum safe distance from the ground is emphasized.

ASCMT5E
November, 1943

ASC BIBLIOGRAPHIES AND TRANSLATIONS

(RUSSIAN DATA ON PARACHUTES)

SPECIAL STUDIES

No. 2 List of Russian Material on Parachutes

TRANSLATIONS

No. 7 Dynamics of Parachute Jumps (Stasevich)

No. 8 Calculation of Parachute Jump Performance (Stasevich and Kogan)

No. 9 Calculation of Delayed Opening Parachute Jump Performance (Stasevich)

No. 10 Stabilization of Fall in Delayed Opening Parachute Jumps (Kotel'nikov)

No. 11 Parachute Inflation Loads at High Altitudes (Stasevich)

No. 12 Automatic Opening Devices for Parachutes (Malinovskii)

No. 13 Use of Parachutes in the War in Spain, the War in China, and the War in Abyssinia (Panov)

Address all communications: Commanding General, Air Service Command, Patterson Field, Fairfield, Ohio. Att: ASCMT5E.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 88TH AIR BASE WING (AFMC)
WRIGHT-PATTERSON AIR FORCE BASE OHIO

25 June 2008

88 CG/SCCMF
3810 Communications Blvd
Wright-Patterson AFB OH 45433-7802

Defense Technical Information Center
Attn: Ms. Kelly Akers (DTIC-R)
8725 John J. Kingman Rd, Suite 0944
Ft Belvoir VA 22060-6218

Dear Ms. Akers

This concerns Technical Report ADB201786, Stabilization of Fall in Delayed Opening Parachute Jumps, November 1943, previously Unclassified/Limited Distribution.

Subsequent to WPAFB FOIA Control Number 08-564LK, this record has been cleared for public release by HQ AFMC/HO, Lt Col Robert Young on 18 Jun 2008. Therefore, record is now fully releasable to the public.

Point of contact is Lynn Kane at (937) 522-3091.

Sincerely

Sheree M. Coon

SHEREE COON
Freedom of Information Act Manager
Management Services Branch
Base Information Management Division

Attachments
1. FOIA Request (WPAFB FOIA control #08-564LK, w/background Referral Ltrs)
2. Cover sheets of ADB201786
3. Copy of AFMC Form 559